ATTACHMENT TO RESOLUTION NO. R8 2005–0097

(NOTE: The following language is proposed to be inserted into Chapter 5 of the Basin Plan. If these amendments are approved, corresponding changes will be made to the Table of Contents, the List of Tables, page numbers, and page headers in the plan. Due to the two-column page layout of the Basin Plan, the location of tables in relation to text may change during final formatting of the amendments. For formatting purposes, the maps may be redrawn for inclusion in the Basin Plan, and the final layout may differ from that of the draft.)

Chapter 5 - Implementation Plan

2. Big Bear Lake and Rathbun Creek Sediment Total Maximum Daily Loads (TMDLs)

Erosion and sedimentation in Big Bear Lake and its watershed has resulted in both direct and indirect adverse impacts on water quality and beneficial uses. These problems led to the placement of the lake and Rathbun Creek, the principal tributary of relevant concern, on the Clean Water Act Section 303(d) list of impaired waters due to sediment in 1994. Sedimentation in Big Bear Lake, particularly at the mouths of tributary creeks such as Rathbun Creek, has resulted in shallower depths and a decrease in lake capacity. In certain areas, the shallow depths hinder or even preclude recreational use, and they provide additional habitat that is suitable for colonization by macrophytes, including Eurasian watermilfoil, (*Myriophyllum spicatum*). Excessive growth of this noxious aquatic plant also impairs recreational use of the lake and results in reduced habitat diversity for plants and wildlife (see the Big Bear Lake Nutrient TMDLs). The nutrients transported with sediment contribute to the eutrophication problem in the lake. Nutrients are deposited on the lake bottom by sedimentation and are then resuspended in the water column where they are available for biological uptake. The deposition of excessive nutrients leads to increased macrophyte and algae production and adverse effects on aquatic habitat and recreation. The Big Bear Lake Nutrient TMDLs shows the nutrient TMDLs that were developed to address the eutrophication problem. Given the interrelationship between sediment and nutrients, the sediment TMDLs and implementation actions identified below were developed in coordination with the development of the nutrient TMDLs.

Rathbun Creek has been hydromodified, which has led to problems with channel stability. Bank erosion and stream bottom down cutting are significant problems in the creek, resulting in significant adverse effects on instream habitat and beneficial uses and leading to sediment transport to the lake. Watershed sources also contribute sediment that is transported to the creek and thence Big Bear Lake. Both recreation and aquatic life habitat beneficial uses of Rathbun Creek are affected by the production and transport of sediment, as well as by the nature and scope of the hydromodifications themselves.

A TMDL staff report prepared by Regional Board staff describes the sediment related problems in Big Bear Lake and Rathbun Creek in greater detail and discusses the technical basis for the TMDLs that follow [Ref. # 1].

1. A. Numeric Targets

Table 5-9a-j and Table 5-9a-k show the numeric targets for Big Bear Lake and Rathbun Creek, respectively. In addition to total sediment load, targets that are more direct indicators of impairment are specified to assess and track water quality and beneficial use improvements. For Big Bear Lake, this indicator target is a 5% increase in lake capacity. For Rathbun Creek, targets include turbidity concentrations and benthic macroinvertebrate metrics.

Table 5-9a-j
Big Bear Lake Sediment TMDL Numeric Targets[a]

Indicator	Target Value
Total Sediment Load	Annual average of 12,000 tons/year as a 10-yr rolling average; to be attained no later than 2020*
Lake Capacity	At least a 5% increase in lake capacity by [*10 years from effective date of BPA*][b]

[a] Compliance with the targets to be achieved as soon as possible, but no later than the date specified
[b] see also Task 5
*Compliance to be determined from data and information collected pursuant to Task 3.1.
[Note: BPA => Basin Plan Amendment]

Table 5-9a-k
Rathbun Creek Lake Sediment TMDL Numeric Targets[a]

Indicator	Target Value[c]
Total Sediment Load	Annual average of 1900 tons/year as a 10-yr running average; to be attained no later than 2020
Turbidity	Increases in turbidity which result from controllable water quality factors shall comply with the following: Natural Turbidity — Maximum Increase 0-50 NTU — 20% 50-100 NTU — 10 NTU Greater than 100 NTU — 10% to be attained no later than 2020
Benthic Macroinvertebrate Metrics	Improving trends in 8 metrics as specified for the SoCal IBI[b]; to be attained no later than 2020

[a] Compliance with the targets to be achieved as soon as possible, but no later than the date specified
[b] SoCal IBI= Southern California Index of Biological Indicators. The SoCal IBI consists of 8 metrics (Percent Collector-Gatherer + Collector-Filterer Individuals, Percent non-insect taxa, percent tolerant taxa, Coleoptera richness, predator richness, scraper richness, average tolerance value and EPT richness). Each metric is scored on a 0-10 scale, therefore, the SoCal IBI has a scoring range of 0-80, where 0 =very poor and 80 = very good. The SoCal IBI assessment is to be performed at least once every 2 years and scores from each metric are to be compared to the previous score. An improving trend is defined as an increase in the total score from the last assessment.

2. B. Sediment TMDLs, WLAs and LAs and Compliance Dates

TMDLs, and the WLAs and LAs necessary to achieve them, are established for both Big Bear Lake and Rathbun Creek for total sediment load. The total sediment TMDLs for Big Bear Lake and Rathbun Creek and the corresponding WLAs for point source discharges and LAs for nonpoint source discharges are shown in Table 5-9a-l.

WLAs are specified for the only point sources in the watershed – urban runoff (e.g., residential and high density urban and highway runoff) subject to NPDES permits. Load allocations for total sediment load are specified for the nonpoint sources -- forest and resort (ski areas) land uses. The WLAs and LAs are expressed as a 10-year running average to account for varied hydrologic conditions.

Table 5-9a-l

Big Bear Lake and Rathbun Creek
Total Sediment TMDLs and Wasteload and Load Allocations

	Big Bear Lake Final Total Sediment Allocation (tons/yr)[b]	**Rathbun Creek Final Total Sediment Allocation (tons/yr)[b]**
TMDL	**12,000**	**1,900**
WLA	**3,100**	**650**
Urban	3,100	650
LA	**7,700**	**1,060**
Forest	7,100	730
Resort	600	330
Margin of Safety	**1,200**	**190**

[a] Compliance with allocations to be achieved as soon as possible, but no later than December 31, 2020.

[b] Specified as a 10-yr running average based on a calendar year

2.C. Margin of Safety

As shown in Table 5-9a-l, the Big Bear Lake and Rathbun Creek sediment TMDLs contain an explicit 10% margin of safety to account for uncertainty associated with the sediment watershed model and the lack of site-specific sediment data for the watershed.

2. D. Seasonal Variations/Critical Conditions

The sediment TMDLs for Big Bear Lake and Rathbun Creek address seasonal variations through the development of allocations based on average loads from 1990 to 2003. This time frame incorporates wet, dry and average hydrological conditions, and thus accounts for seasonal (and annual) variations.

Erosion and sediment deposition exert both immediate and long-term adverse impacts on beneficial uses. Critical conditions that result in the more immediate effects include the relatively infrequent, high intensity storms that occur largely in the winter months but may also take the form of intense summer thundershowers. These events can result in significant erosion and the transport and deposition of sediment, removing or covering up spawning habitat for aquatic species and causing sediment plumes that make the water aesthetically unpleasing for recreational activities. Over the long-term, shallower depths resulting from sediment deposition can hinder or preclude recreational activities and modify aquatic life habitat and community structure. Shallower depths in certain areas of Big Bear Lake provide additional habitat suitable for colonization by nuisance aquatic macrophytes, which in turn adversely affect recreational and wildlife beneficial uses. The long-term effects of sediment deposition are most pronounced during the spring and summer of dry years, when the level of the lake declines and water levels are typically shallower. Recreational use is generally at its peak, and this is the period of macrophyte growth. To address this range of critical conditions, the TMDL implementation plan requires the development and implementation of an approved lake management plan that must be coordinated with the identification of strategies designed to address channel stability and erosion/sedimentation problems in Rathbun Creek. Management strategies to restore and protect beneficial uses in the lake and Rathbun Creek (as well as other tributaries) must be identified, taking into account the need to address these critical conditions.

2. E. TMDL Implementation

Table 5-9a-m outlines the tasks and schedules to implement the TMDLs. Each of these tasks is described below. To the extent feasible, the implementation tasks are to be coordinated with the implementation tasks specified in the Big Bear Lake Nutrient TMDLs. Other TMDLs are expected to be developed for the Big Bear Lake watershed. Where it is appropriate to do so, these TMDLs will identify the need to coordinate implementation with the sediment (and nutrient) TMDLs.

Table 5-9a-m

Big Bear Lake and Rathbun Creek Sediment TMDL Implementation
Plan/Schedule Report Due Dates

Task	Description	Compliance Date-As soon As Possible but No Later Than
TMDL Phase 1		
Task 1	Establish New Waste Discharge Requirements for Sediment Sources	*(*6 months after BPA approval*)*
Task 2	Revise Existing Waste Discharge Requirements	*(*6 months after BPA approval*)*
Task 3	Sediment Water Quality Monitoring Program 3.1 Watershed-wide Sediment Monitoring Plan(s) 3.2 Big Bear Lake Sediment Monitoring Plan(s) (same as required for the nutrient TMDL)	Plan/schedule due *(*3 months after BPA approval*)* Annual reports due February 15
Task 4	Big Bear Lake and Watershed Model Updates	Plan/schedule due *(*6 months after BPA approval*)*
Task 5	Big Bear Lake – Lake Management Plan	Plan/Schedule due *(*3 years after BPA approval*)*
Task 6	Big Bear Lake – Sedimentation Processes Plan	Due *(*6 months after BPA approval*)*
Task 7	Review and Revise Sediment Related Water Quality Objectives	December 31, 2012
Task 8	Review of TMDLs/WLAs/LAs	Once every 3 years

[Note: BPA => Basin Plan Amendment]

Task 1: Establish New Waste Discharge Requirements for Sediment Sources

On or before (**6 months from the effective date of this BPA*), and consistent with the schedule specified in the Big Bear Lake Nutrient TMDLs, the Regional Board shall issue the following new waste discharge requirements or Conditional Waivers of Waste Discharge Requirements:

1.1 Waste Discharge Requirements (WDRs) or Conditional Waiver of WDRs to the US Forest Service to incorporate the sediment load allocations and monitoring and reporting requirements for forested areas.

1.2 Waste Discharge Requirements (WDRs) or Conditional Waiver of WDRs to the Big Bear Mountain Resorts to incorporate the sediment load allocations and monitoring and reporting requirements for ski areas.

Other sediment discharges will be addressed and permitted as appropriate.

Task 2: Review and/or Revise Existing Waste Discharge Requirements

Waste Discharge Requirements (WDRs) have been issued by the Regional Board to regulate discharges of various types of wastes in the Big Bear Lake watershed. On or before (**6 months from the effective date of this Basin Plan amendment**), and consistent with the schedule specified in the Big Bear Lake Nutrient TMDLs, these WDRs shall be reviewed and revised as necessary to incorporate sediment wasteload allocations and TMDL monitoring requirements.

2.1 Waste Discharge Requirements for the San Bernardino County Flood Control and Transportation District, the County of San Bernardino and the Incorporated Cities of San Bernardino County within the Santa Ana Region, Areawide Urban Runoff, NPDES No. CAS 618036 (Regional Board Order No. R8-2002-0012). The current Order has provisions to address TMDL issues. In light of these provisions, revision of the Order may not be necessary to address TMDL requirements.

2.2 State of California Department of Transportation (Caltrans) Stormwater Permit
Provision E.1 of Order No. 99-06-DWQ requires Caltrans to maintain and implement a Storm Water Management Plan (SWMP). Annual updates of the SWMP needed to maintain an effective program are required to be submitted to the State Water Resources Control Board.

Provision E.2 of Order No. 99-06-DWQ requires Caltrans to submit a Regional Workplan by April 1 of each year for the Executive Officer's approval. As part of the annual update of the SWMP and Regional Workplan, Caltrans shall submit plans and schedules for conducting the monitoring and reporting requirements specified in Task 3 and the special studies required in Tasks 4, 5 and 6.

Task 3: Sediment Water Quality Monitoring Program

3.1 Watershed-wide Sediment Monitoring Plan (s)

No later than (**3 months from effective date of this Basin Plan amendment* *), and consistent with the schedule specified in the Big Bear Lake Nutrient TMDLs, the US Forest Service, the State of California Department of Transportation (Caltrans), the County of San Bernardino, San Bernardino County Flood Control District, the City of Big Bear Lake and Big Bear Mountain Resorts shall, as a group, submit to the Regional Board for approval a proposed watershed-wide sediment monitoring plan that will provide data necessary to review and update the Big Bear Lake and Rathbun Creek sediment TMDLs, and to determine specific sources of sediment to Big Bear Lake and Rathbun Creek. Data to be collected and analyzed shall address, at a minimum, determination of compliance with the Big Bear Lake sediment TMDL, including numeric targets, WLAs and LAs and with the Rathbun Creek sediment TMDL, including numeric targets, WLAs and LAs. The proposed sampling plan shall also include plans, protocols, sampling locations, and a schedule for conducting benthic macroinvertebrate analyses according to the DFG's Stream Bioassessment Procedure [Ref. #2]. The plan shall include a proposal for establishing a stream reference reach for tributaries to Big Bear Lake.

The proposed plan shall be coordinated with the Big Bear Lake Nutrient TMDLs Monitoring Program, and at a minimum, shall include the consideration of the collection of samples at the stations specified in

Table 5-9a-n and shown in Figure 5-9, at the frequency specified in Table 5-9a-o. If one or more of these monitoring stations are not included, rationale shall be provided and proposed alternative monitoring locations shall be identified in the proposed monitoring plan. Consistent with requirements of the Big Bear Lake Nutrient TMDLs (Task 3), flow measurements shall be taken each time water quality samples are obtained.

The proposed plan shall also include protocols and a schedule for conducting Unified Stream Assessments, using an established stream assessment protocol, of the major tributaries in the watershed to locate and evaluate problems pertaining to sediment and erosion and to identify restoration opportunities within the stream corridors.

At a minimum, samples shall be analyzed for the following constituents:

- Suspended sediment concentration
- Grain size
- Total nitrogen in sediment
- Turbidity
- Bedload concentration
- Total phosphorus in sediment

The proposed monitoring plan shall be implemented upon Regional Board approval at a duly noticed public meeting. An annual report summarizing the data collected for the year and evaluating compliance with the WLAs/LAs shall be submitted by February 15 of each year.

In lieu of this coordinated monitoring plan, one or more of the parties identified above may submit a proposed individual or group monitoring plan for Regional Board approval. Any such individual or group monitoring plan is due no later than (*3 *months from effective date of this Basin Plan amendment**) and shall be implemented upon Regional Board approval at a duly noticed public meeting. An annual report of data collected pursuant to approved individual/group plan(s) shall be submitted by February 15 of each year. The report shall summarize the data and evaluate compliance with the WLAs/LAs.

Table 5-9a-n

Big Bear Lake Watershed – Sediment TMDL
Minimum Required Sampling Station Locations

Station Number	**Station Description**
MWDC3	Grout Creek at Hwy 38
MWDC4	Rathbun Creek at Sandalwood Ave.
MWDC8a	Knickerbocker Creek at Hwy 18
MWDC13	Boulder Creek at Hwy 18
MWDC20	Minnelusa Creek at Hwy 38

At a minimum, samples shall be analyzed at the frequencies specified in Table 5-9a-o:

Table 5-9a-o

Big Bear Lake Watershed – Sediment TMDL
Sampling Frequency

Flow type	**Months monitoring is required**	**Frequency**
Snowmelt	January 1 – May 31[1]	Varied -See note 1 below
Storm events	January 1 – December 31	5 storms per year[2]

[1] Samples to be collected daily for the first three days of the snowmelt period. If ambient air temperatures remain above freezing after three days have passed, snowmelt sampling will then be performed once a week for the following three weeks or until the snowmelt period ceases. Snowmelt cessation will be determined by one of the following: a) ambient air temperatures drop below freezing during most of the day; or b) a storm/rain precipitation event occurs after the snowmelt event was initiated. Beginning March 15th of each year, snowmelt flows will most likely be continuous since ambient air temperatures will usually remain above freezing. From March 15th through May 31 of each year, snowmelt sampling events will be conducted daily for the first two days of a snowmelt event and then once a week thereafter until the spring runoff period has ended or the tributary station location shows no signs of daily flows for one week. Flow status will be evaluated in the afternoon, when ambient air temperatures are highest and flow potential is greatest.

[2] Three storm events to be sampled during October – March; two storm events to be sampled during April – September. For each storm event, eight samples across the hydrograph are to be collected.

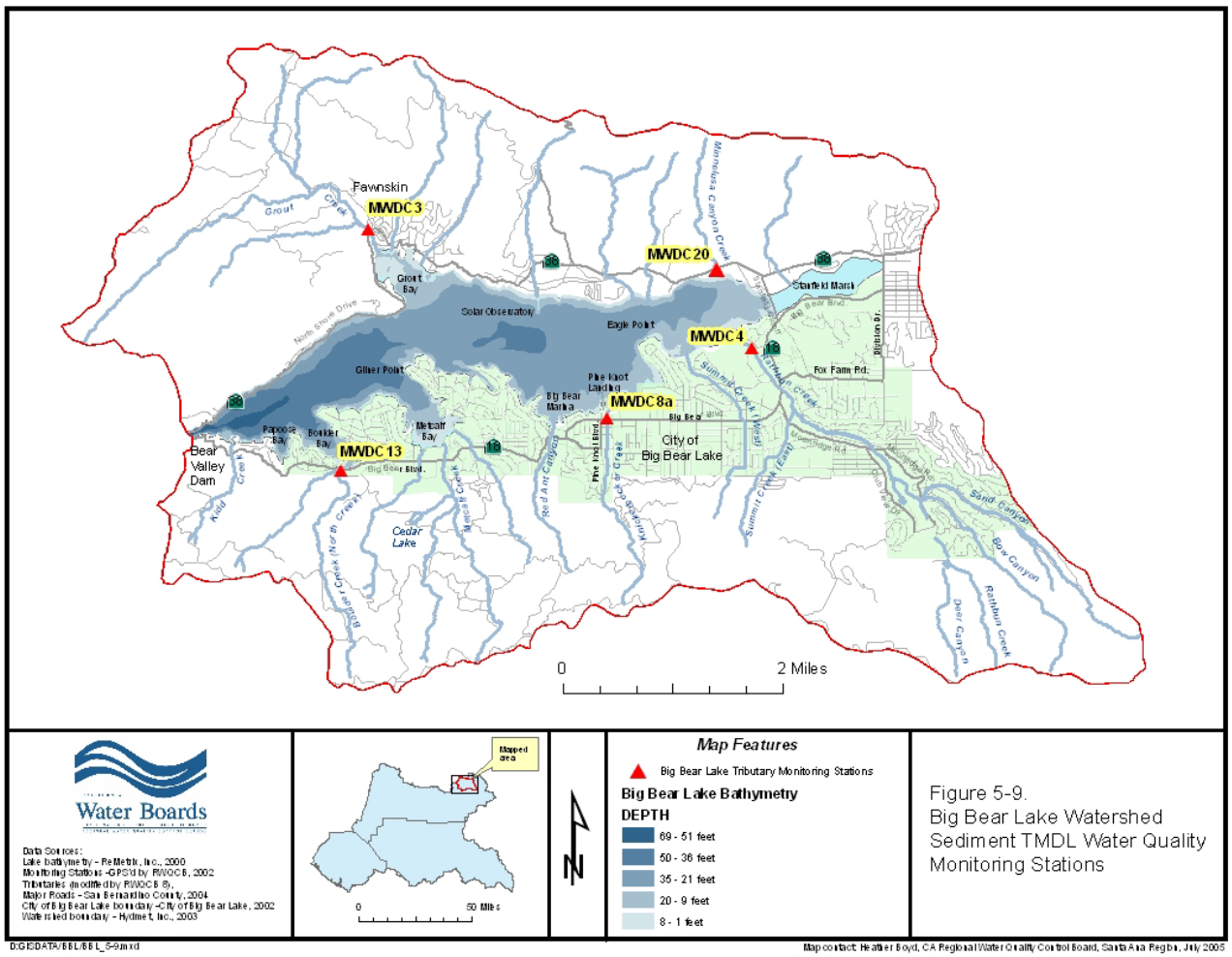

Figure 5-9 – Big Bear Lake Watershed Sediment TMDL Water Quality Stations

3.2 Big Bear Lake: In-Lake Monitoring Program

Task 4.2 of the Big Bear Lake Nutrient TMDLs includes requirements for the development and implementation of an in-lake monitoring program by the following responsible parties; the US Forest Service, the State of California Department of Transportation (Caltrans), the County of San Bernardino, San Bernardino County Flood Control District, the City of Big Bear Lake and Big Bear Mountain Resorts. Implementation of the Nutrient TMDL monitoring program will suffice to provide data on sediment related conditions in Big Bear Lake. In addition, determination of compliance with the Big Bear Lake - Lake Capacity numeric target specified in Table 5-9a-j, will be achieved via implementation of the Big Bear Lake Management Plan (Task 5, below).

Task 4: Update of Watershed and In-Lake Sediment Models

No later than (**6 months from effective date of this Basin Plan amendment* *), and consistent with the schedule specified in the Big Bear Lake Nutrient TMDLs, the US Forest Service, the State of California Department of Transportation (Caltrans), the County of San Bernardino, San Bernardino County Flood Control District, the City of Big Bear Lake, and Big Bear Mountain Resorts, shall, as a group, submit to the Regional Board for approval a proposed plan and schedule for updating the existing Big Bear Lake watershed sediment model and preparing a Big Bear Lake in-lake sediment model. The proposed plan shall be coordinated with the Big Bear Lake nutrient TMDLs watershed and in-lake model plan (Nutrient TMDL Task 6). The plan and schedule must take into consideration additional data and information that are or will be generated from the respective TMDL monitoring programs (Task 3, above).

The plan for updating the watershed and in-lake models shall be implemented upon Regional Board approval at a duly noticed public meeting.

In lieu of this coordinated plan, one or more of the parties identified above may submit a proposed individual or group Watershed and In-lake Sediment Model Update Plan for approval by the Regional Board. Any such individual or group Plan is due no later than (**6 months from effective date of this Basin Plan amendment**)* and shall be implemented upon Regional Board approval at a duly noticed public meeting.

Task 5: Big Bear Lake – Lake Management Plan

No later than (**3 years from effective date of this Basin Plan amendment* *), the US Forest Service, the State of California Department of Transportation (Caltrans), the County of San Bernardino, San Bernardino County Flood Control District, the City of Big Bear Lake, and Big Bear Mountain Resorts, shall, as a group, submit to the Regional Board for approval a proposed Big Bear Lake Management Plan. The purpose of the Plan is to identify a coordinated and comprehensive strategy for management of the lake to address restoration and protection of the lake's beneficial uses. At a minimum, the plan shall address the following:

- The plan shall be based on identified goals for lake capacity that are consistent with the lake capacity numeric target, as well as goals for biological resources and recreational opportunities.
- The plan must include a methodology for measuring changes in the capacity of the lake to enable determination of compliance with the proposed lake capacity numeric target.
- The proposed plan shall identify recommended short and long-term strategies for control and management of sediment inputs to the lake and sediment in the lake, including dredging.
- The plan shall integrate management plans and control measures designed to assure compliance with approved nutrient TMDLs for Big Bear Lake and its tributaries.
- The plan shall also integrate the beneficial use survey information required to be developed pursuant to the Regional Board's March 3, 2005, Clean Water Act Section 401 Water Quality Standards Certification for Big Bear Lake Nutrient/Sediment Remediation Project, City of Big Bear Lake, County of San Bernardino, California. The purpose of the beneficial use survey is to correlate beneficial uses of the lake with lake bottom contours. The survey will be conducted over the entire lake. The survey will determine the location and the quality of beneficial uses of the lake and the contours of the lake bottom where these uses occur. The survey will be used in regulating future lake dredge projects to maximize the quality of the lake's beneficial uses.
- The submittal shall also contain a proposed sediment monitoring program to evaluate the effectiveness of any strategies implemented.

The Big Bear Lake Management Plan shall be implemented upon Regional Board approval at a duly noticed public meeting. Once approved, the plan shall be reviewed and revised as necessary at least once every three

years. The review and revision shall take into account assessments of the efficacy of control/management strategies implemented and relevant requirements of new or revised TMDLs for Big Bear Lake and its watershed.

In lieu of this coordinated plan, one or more of the parties identified above may submit an individual or group Big Bear Lake –Lake Management Plan for approval by the Regional Board. Any such individual or group Plan is due no later than (*3 *years from effective date of this Basin Plan amendment*)* and shall be implemented upon Regional Board approval at a duly noticed public meeting.

Task 6: Big Bear Lake –Sedimentation Processes Plan

No later than (*6 months *from effective date of this Basin Plan amendment* *), the US Forest Service, the State of California Department of Transportation (Caltrans), the County of San Bernardino, San Bernardino County Flood Control District, the City of Big Bear Lake, and Big Bear Mountain Resorts, shall, as a group, submit to the Regional Board for approval a proposed plan and schedule for development of a Big Bear Lake Sedimentation Processes Plan for the determination of the dominant sedimentation processes in Big Bear Lake.

At a minimum, the proposed plan shall include the placement of sediment traps at the mouths of Rathbun, Knickerbocker, Grout, Boulder and Minnelusa Creeks to determine the rate of influx of sediment to Big Bear Lake, as specified in Table 5-9a-n and shown in Figure 5-9, at the specified frequency indicated in Table 5-9a-o. If one or more of these sites are not included, rationale shall be provided and proposed alternate sites shall be identified in the proposed plan. In addition, the proposed plan shall include the collection of sediment cores, geochemical analyses and a seismic reflection survey to enable the determination of pre-dam and post-dam sediment, sediment unit thickness, and depositional processes. The location and schedule for the collection and analysis of the sediment cores shall be identified by the responsible parties mentioned above. These analyses will aid in the determination of the major processes affecting lake sedimentation as well as the lake sedimentation rate.

In lieu of this coordinated plan, one or more of the parties identified above may submit a proposed individual or group Big Bear Lake – Sedimentation Processes Plan proposal for approval by the Regional Board. Any such individual or group Plan is due no later than (*6 *months from effective date of this Basin Plan amendment*)* and shall be implemented upon Regional Board approval at a duly noticed public meeting.

Task 7: Review and Revision of Water Quality Objectives

By December 31, 2012, the Regional Board shall review and revise as necessary the numeric water quality objectives for turbidity and the narrative objectives for suspended solids for Big Bear Lake and Rathbun Creek. The Regional Board shall also examine the appropriateness of establishing biocriteria for Big Bear Lake and Rathbun Creek. Given budgetary constraints, completion of this task is likely to require substantive contributions from interested parties.

Task 8: Review/Revision of the Big Bear Lake Sediment TMDL (TMDL "Re-opener")

The basis for the TMDLs and implementation schedule will be re-evaluated at least once every three years[1] to determine the need for modifying the allocations, numeric targets and TMDLs. Regional Board staff will continue to review all data and information generated pursuant to the TMDL requirements on an ongoing basis. Based on results generated through the monitoring programs, special studies and/or modeling analyses, changes to the TMDLs may be warranted. Such changes will be considered through the Basin Plan Amendment process.

The Regional Board is committed to the review of these TMDLs every three years, or more frequently if warranted by these or other studies.

References

1. California Regional Water Quality Control Board, Santa Ana Region. Staff Report on the Sediment Total Maximum Daily Loads for Big Bear Lake, July, 2005.

2. California Department of Fish and Game. California stream bioassessment procedure: Protocol brief for biological and physical/habitat assessment in wadeable streams, December, 2003.

[1] The three-year schedule is tied to the 3 year triennial review schedule.